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Protein markers for the salting and ripening process in Herring production

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Aim

To find protein markers for controlling and standardizing production of ripened herring products.

Experiment

Comparing the effect of the matjes salting process on protein changes in fillet from two different herring stocks: Norwegian Spring Spawning herring and North Sea herring. Besides the effects of gutting (removal of intestine and *Calanus sp*.) in the North sea herring was investigated.
The salting and ripening process lasted 18-24 hrs.
2DE (pI: 4-7; SDS-PAGE T: 12 %; cCBB staining). N=5x10

Background:
Salting and ripening of pelagic fish species have since ancient times been performed on an empirical basis and production of the light salted traditional matjes herring from whole fatty North Sea herring (*Clupea harengus*) is also based on an old practical procedure. In this the caught herring should contain *Calanus sp*. in its intestinal tract (increasing amount of digestive enzymes) in order to achieve the proper matjes herring sensory quality. Thus it is anticipated that proteolytic enzymes have an important influence on the final product.

North sea herring: **R**: raw material; **G**: salted as gutted fish; **M**: salted as deheaded fish (matjes)
Norwegian Spring Spawning herring: **N-R**: raw material; **N-M**: salted as deheaded fish

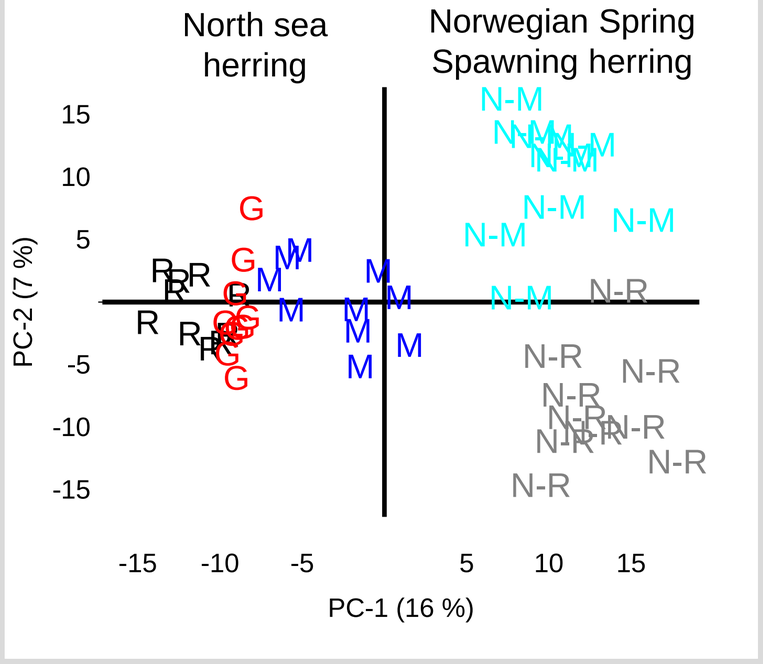

Figure 1. Species differences constitute the main variation in data, although clear grouping according to ripening is evident in this PCA (principal component analysis) scores plot. The result is based on the normalised volumes of the 660 protein spots that could be quantitatively compared between all the 50 analysed gels.

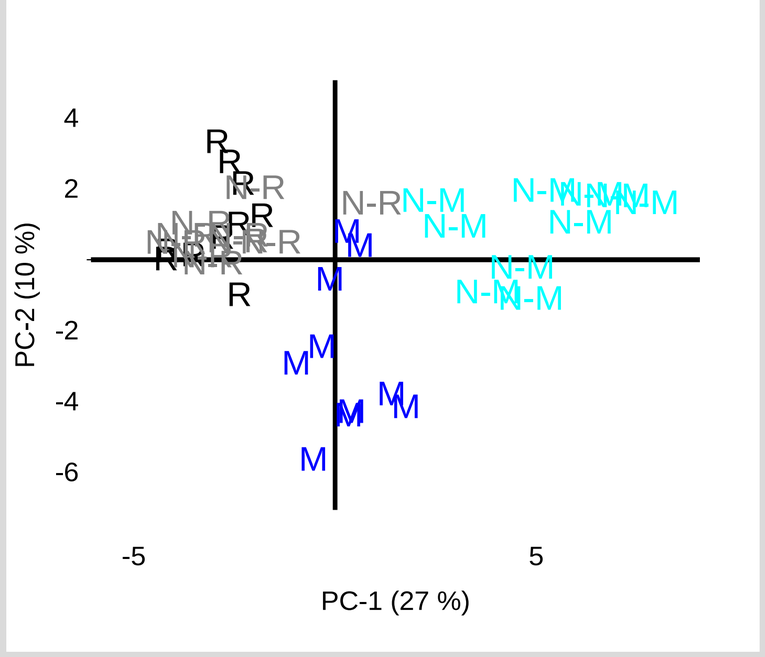

Figure 2. Common features in the ripening process between the two species. The PCA scores plot is based on 44 selected spots (the marked spots in Figure 4). Spot selection: Spots changing significantly ($p<0.01$) during ripening within the two species were selected but spots differing significantly between the two raw materials were excluded.

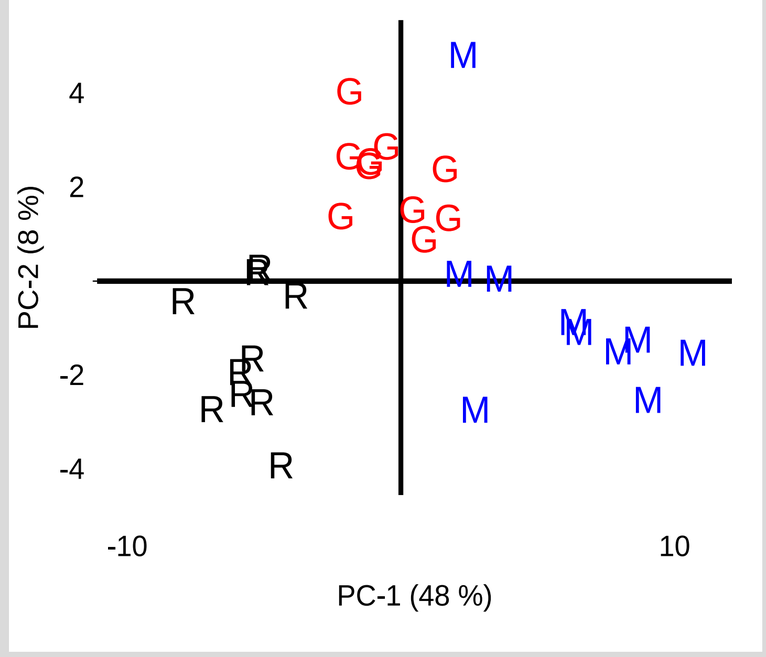

Figure 3. Presence of *Calanus* sp. in the intestine has an effect on ripening. During matjes production 64 spots changed significantly in volume compared to the raw material. The PCA scores plot grouped the samples from the raw herring and the two products along the first PC, with the product that was produced from the gutted fish in between the raw herring and the traditional matjes.

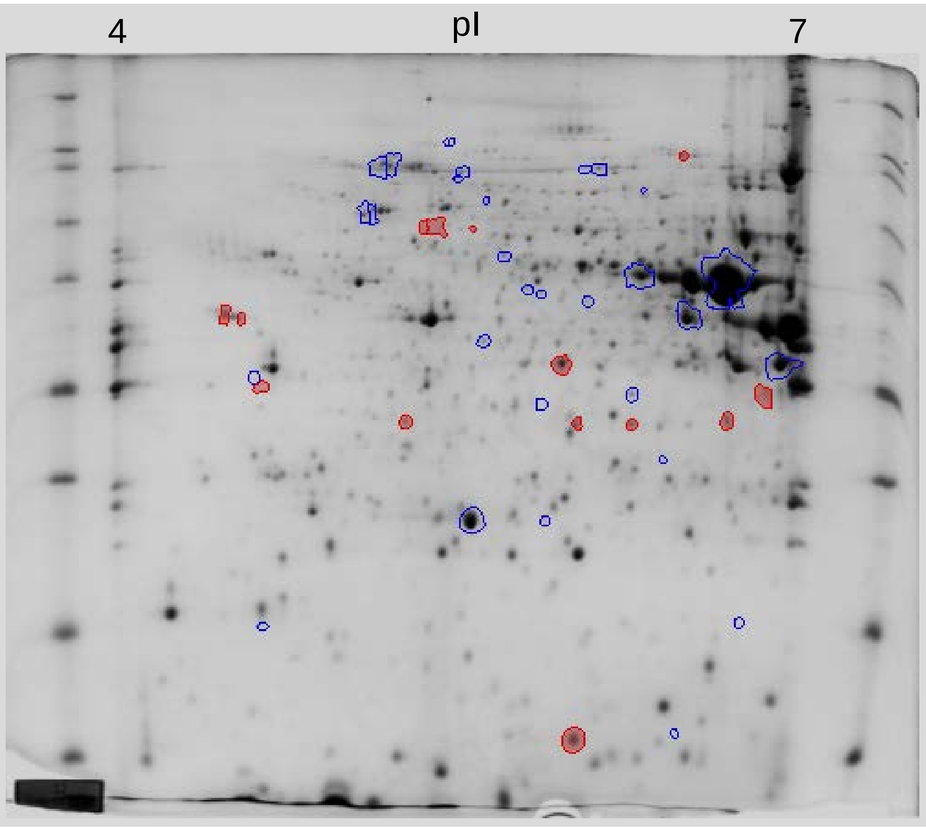

Figure 4. Gel of water soluble proteins from a North sea herring. The 44 selected spot (see Figure 2.) are marked (red and blue). 14 of these spots (red) are common for the ripening process in the two species whereas the remaining 30 spots (blue), 9 and 21 are specific for the ripening process in North sea herring and Norwegian Spring Spawning herring, respectively.

Conclusions

- The ripening process in the two herring species causes some common, but also species specific protein changes (Figure 2).
- 17 of the protein changes occurring during the traditional matjes production also took place when gutted fish were used. This indicates that not all the observed protein changes were dependent on intestinal or gut enzymes, but were caused by inherent muscle enzymes.

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